**Birla Institute of Technology and Science, Pilani** Hyderabad Campus

**FIRST SEMESTER 2019-2020**

**Course Handout (Part II) for BIO F111 (General Biology)**



Date: 01.08.2019

In addition to Part – I (General Handout for all courses) printed on Page 1 of the timetable book; this portion gives further specific details regarding the course.

**Course Number Course Title Instructor In-charge**

**: BIO F111**

**: GENERAL BIOLOGY**

**: GIREESHA T. MOHANNATH**

**Instructors:** Ramakrishna Vadrevu, Jayati Ray Dutta, Sridev Mohapatra, Debashree Bandyopadhyay, Vivek Sharma, Trinath Jamma, Piyush Khandelia and Gireesha T. Mohannath

**Course Description:** This is an introductory/ foundation level course, where students are expected to learn about living systems and their properties, major biological compounds, basic biochemical and physiological processes. Students will also get introduced to genetics and recombinant DNA technology and their applications in daily life. While designing the course, care has been taken to relate the principles of biology with other science and engineering disciplines, wherever possible.

**Scope and Objective :** Some students question the need for a course in biology, especially when their area of studyis not related to biology (or science). However, it is becoming increasingly important to understand the nature of science and fundamental biological concepts for any person, regardless of his or her occupation. In this context, through this course it has been intended to impart knowledge on biological system with respect to nature, behavior and functioning of the cell. Further, this course has also been designed to make the student understand intricate relationship that living organisms have with their environment, at the molecular level, so that impact of modern biological research can be understood and appreciated by them. It is expected that at the end of this course, students would become aware of the influence of biology in almost every aspect of their lives.

**Intended Learning Outcomes:** After successful completion of this course, students will be able to but not limited to:

* Comprehend various aspects of biology
* Understand biomolecules, and enzymes
* Outline cell structure and function
* Appreciate biochemical pathways
* Explain molecular basis of heredity and genetic diversity
* Apply biotechnology to some aspects of daily life
* Compare and contrast material exchanges in human body
* Examine human body’s control mechanism including reproduction

**Text Book**

**: T:** Eldon D. Enger, Frederick C. Ross and David B. Bailey, Concepts in Biology, 14thEdition

(BITS Pilani, Custom Edition) Tata McGraw Hill Publishing Company Limited, 2012.

**Reference Books**

**: R1:** Peter H. Raven, George B. Johnson, Jonathan B. Losos, Susan R. Singer Biology,

7th Edition. WBC McGraw Hill, 2005.

**R2:** C. Starr, Biology: Concept and application, 6thEdition, Thomson Learning.

**Suggested Reading**

**: S1:** Campbell, N.A., Reece J.B., Biology, 7thEdition, Pearson Education Inc, 2009. **S2:** Campbell, N.A.,*et. al.*Essential Biology with Physiology, 2ndEdition,Pearson Education Inc, 2009.

**Course Plan:**

|  |  |  |  |
| --- | --- | --- | --- |
| ***Lecture*** |  |  | ***Reference*** |
| ***Learning objectives*** | ***Topics to be covered*** | ***Chapter in*** |
| ***Number*** |
|  |  | ***text book*** |
|  |  |  |
| 1 | Introduction | Introduction to biology and its importance to daily life | 1.4 |
|  |  |  |  |
| 2 | Chemistry of life: | Organic Chemistry, Carbohydrates and lipids |  |
|  | Organic molecules |  | 3 |
| 3 | Proteins and nucleic acids |
| Molecules of life |  |
|  |  |  |  |
| 4 |  |  |  |
|  |  |  |  |
| 5 |  | Cell theory, cell membrane and transport in cells |  |
|  |  |  |  |
| 6 | Cell structure and function | Membranous organelles | 4 |
|  |  |
|  | Non-membranous organelles |
|  |  |  |
| 7 |  | Nuclear components |  |
|  |  | Major cell types |  |
|  |  |  |  |
| 8 |  | Nomenclature |  |
| Enzymes | Bio-catalysis: Hypotheses |  |
|  |  |
|  |  |  |
|  | Coenzymes | Environmental factors | 5 |
|  | Energy |  |
| 9 | Co-enzymes |  |
|  |  |
|  |  | Enzyme activation and inhibition |  |
|  |  |  |  |
| 10 |  | Glycolysis |  |
|  | TCA cycle |  |
|  |  |  |
|  |  |  |  |
| 11 |  | Electron Transport System | 6 |
| Biochemical pathways | ATP calculation |
|  |  |
|  |  |  |
| 12 |  | Fermentation |  |
|  | Protein and fat metabolism |  |
|  |  |  |
|  |  |  |  |
| 13 |  | Photosynthesis | 7 |
|  |  |  |  |
| 14 |  | Classification and evolution of organisms |  |
|  | Taxonomy |  | 20 |
| 15 | Brief survey of domains |
|  |  |
|  | Acellular infectious particles |  |
|  |  |  |
|  |  |  |  |
|  |  | Central Dogma |  |
| 16 | DNA & RNA: | Molecular structure |  |
|  | Duplex DNA and its replication |  |
|  | The molecular basis of |  | 8 |
| 17 | Gene expression: Transcription and translation |
| heredity |  |
|  |  |  |  |
| 18 |  | Mutation and mutagenesis |  |
|  |  |  |  |
| 19 |  | Polymerase chain reaction |  |
|  | DNA fingerprinting |  |
|  |  |  |
|  |  |  |  |
| 20 | Applications of | DNA sequencing |  |
| Human genome project | 11 |
|  | biotechnology |
|  |  |  |
|  | Genetic modification of organisms |  |
|  |  |  |
| 21 |  | Cloning of organisms: Illustration (Dolly), Stem cells, |  |
|  |  | Biotechnology & Ethics |  |
|  |  |  |  |
| 22 |  | Cell cycle: Stages of mitosis |  |
|  |  |  |  |
| 23 | Cell division: | Abnormal cell division: Basis of oncology |  |
|  |  |  |
|  |  |  |
| 24 | Mitosis: Body cell division | Introduction to Meiosis I and II & crossing over | 9 |
|  | Meiosis: Sex cell formation |  |  |
|  | Nondisjunction |  |
|  |  |  |
| 25 |  | Sex determination |  |
|  |  | Comparison of mitosis and meiosis |  |
|  |  |  |  |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 26 |  | Inheritance patterns and laws |  |
|  |  |  |  |
| 27 | Mendelian genetics: | Multiple allelism |  |
|  |  | 10 |
|  | Sex linked inheritance |
| 28 | Concepts and problems |
|  |
|  | Pleiotropy |  |
|  |  |  |
|  |  |  |  |
| 29 |  | Polygenic inheritance and environmental influences |  |
|  |  |  |  |
| 30 | Genetic diversity within | Speciation | 12.1 - 12.4 |
| Gene pool concept |
|  | 13.1 - 13.5 |
|  | species |  |
| 31 | Hardy-Weinberg equilibrium and its applications | & 13.9 |
|  |
|  |  |
|  |  |  |  |
| 32 |  | Cardiovascular system: Blood, blood vessels, heart and |  |
|  | lymphatic system |  |
|  |  |  |
|  |  |  |  |
| 33 | Material exchanges in the | Respiratory system | 24 |
|  |  |
| 34 | human body | Obtaining nutrition: Mechanical and Chemical |
|  |
|  |  |
|  | processing of food |  |
|  |  |  |
|  |  |  |  |
| 35 |  | Waste Disposal: Kidney structure & function |  |
|  |  |  |  |
| 36 |  | Nervous system: Nerve impulse, events at the synapse |  |
|  | and organization of nervous system |  |
|  |  |  |
|  |  |  |  |
| 37  38 |  | Endocrine system |  |
|  |  |  |
|  | Sensory input (taste, smell, vision, hearing & touch) | 26 |
|  | Body’s control mechanism |
|  |  |
| 39 | Output coordination (muscle contraction) |  |
|  |  |
|  | Immune system and defense mechanisms |  |
|  |  |  |
|  |  |  |  |
| 40 |  | Acquired and cell-mediated immune responses |  |
|  | Blood typing and AIDS |  |
|  |  |  |
|  |  |  |  |
| 41 |  | Chromosomal determination of sex |  |
|  | Male and female fetal development | 27 |
|  | Sex and reproduction |
|  |  |
| 42 | Hormonal control of fertility |  |
|  |  |
|  | Fertilization, pregnancy and contraception |  |
|  |  |  |
|  |  |  |  |

**Self-study:** Nutrition–Food and Diet: Chapter 25 in the textbook.

These portions will be included in evaluation components such as Midsemester and Comprehensive exams etc.

**Evaluation Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Evaluation component*** | ***Duration*** | ***% (Marks)*** | ***Date and time*** | ***Nature of the Component*** |
| **Mid Semester Examination** | 1.5 Hrs | 30 (90) | 28/09/2019  1.30-3.00 PM | Closed Book |
| **Test/ quiz**\* **(total of 4)** | Diverse | 30 (90) | Will be announced later | Closed Book |
| **Comprehensive examination** | 3 Hrs | 40 (120) | 03/12/2019  9.00AM-12:00 PM | Closed Book (20% &  Open Book (20%) |

\*Test/ Quiz will be conducted during tutorial hours.

**Chamber Consultation Hour**:To be announced by the respective tutorial section instructor.

**Grading Policy**:Award of grades will be guided in general by the histogram of marks. Decision on border line caseswill be taken based on individual’s sincerity, student’s regularity in attending classes, and the section instructor’s assessment of the student.

**Make-up Policy**:Make-up for Mid semester examination will be given only in genuine (medical emergency) cases ofabsence. If the absence is anticipated, before the examination, prior permission of the Instructor-in-charge is necessary. Request for make-up should reach the Instructor-in-charge at the earliest. Make-up for tutorial/ class tests/ quizzes are not given. Also refer to Clause 4.07 of BITS *Academic Regulations* for more details.

**Notices**:All notices/ announcements regarding this course shall be displayed in Course Management System (CMS).

**Academic Honesty and Integrity Policy**:Academic honesty and integrity are to be maintained by all the studentsthroughout the semester and no type of academic dishonesty is acceptable.

**Gireesha T. Mohannath**

**Instructor In-charge**

**BIO F111**